



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/805,911	03/15/2001	Ronald A. Weimer	M4065.0434/P434	2915

24998 7590 05/02/2003

DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP  
2101 L STREET NW  
WASHINGTON, DC 20037-1526

EXAMINER

TOLEDO, FERNANDO L

ART UNIT	PAPER NUMBER
----------	--------------

2823

DATE MAILED: 05/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/805,911

Applicant(s)

WEIMER ET AL.

Examiner

Fernando Toledo

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 February 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-68 is/are pending in the application.
- 4a) Of the above claim(s) 57-68 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All   b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_                      6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 – 8, 11, 13 – 24, 27, 29 – 43, 46 and 48 – 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (U. S. patent 5,607,874) in view of Mizuhara et al. (U. S. patent 6,288,438 B1).

In re claims 1, 21 and 40; Wang discloses in the U. S. patent 5,607,874; figures 1 – 9 and related text, forming several gate stacks over a substrate (10), each of the gate stacks include a gate oxide layer (11) and a conductive layer (16); forming spacers (20) on sidewalls of each of the several gate stacks; forming a source/drain region (12 and 8) in the substrate on opposite sides of the gate stack structure; forming a composite barrier layer over the source/drain regions (8 and 12), the composite barrier layer includes an oxide layer (22) and a barrier layer (24) over the oxide layer; forming a glass insulating layer (30) over the composite barrier layer; forming an opening (42) in the glass insulating layer and the composite barrier layer to expose at least a portion of the upper surfaces of the source/drain regions; and forming a conductor 48 in the opening.

Wang does not teach wherein the oxide layer is formed by oxidizing the upper surface of the source/drain region using atomic oxygen.

However, Mizuhara in the U. S. patent 6,288,438 B1; figures 1 – 29 and related text, discloses, as a well-known method, forming an oxide layer over the substrate using atomic oxygen (column 4 and column 12).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the oxide layer of Wang as disclose by Mizuhara, by using atomic oxygen, since according to Mizuhara it is a well-known technique and it will enable the practitioners of Wang to form the oxide layer.

In re claim 2, Wang teaches further including the step of forming a glass layer in contact with the barrier layer (30) of the composite insulating structure.

In re claims 3, 37 and 54, Wang teaches wherein the glass layer is a doped glass film (column 5).

In re claims 4, 38 and 55, Wang teaches wherein the doped glass film includes BPSG material (column 5).

In re claims 5, 39 and 56, Wang teaches wherein the doped glass includes PSG material (column 5).

In re claims 6, 7, 22, 23, 41 and 42, Mizuhara teaches wherein the oxide layer is grown at a temperature of about 300 – 900°C (column 4).

In re claims 8, 24 and 43, Wang in view of Mizuhara does not show wherein the oxide layer is grown for about 1 second to about 10 minutes.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to grow the oxide layer from about 1 second to about 10 minutes since time of oxidation is a very well-known process variable and determining the optimum or workable ranges requires only routine experimentation by someone of ordinary skill in the art. Note that the specification contains no disclosure of either the critical nature of the claimed time or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen time or upon another variable recited in a claim, the Applicant must show that the chosen time range is critical. In re Woodruf, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claims 11, 27 and 46 Mizuhara teaches wherein the atomic oxygen is supplied by a plasma source (columns 4 and 12).

In re claims 13, 29 and 48 Mizuhara teaches wherein the atomic oxygen is supplied by photoexcitation (column 12).

In re claims 14 and 30, Mizuhara teaches wherein the oxide layer is formed in a batch furnace system (column 12).

In re claims 15, 31 and 49, Wang teaches wherein the oxide layer is formed to a thickness of about 20 Å to 500 Å (column 4).

In re claims 16, 32 and 50, Wang in view of Mizuhara does not teach wherein the oxide layer is formed to a thickness of about 50 Å to about 100 Å.

However, thickness is a well known process variable and it would have been obvious to one of ordinary skill at the time the invention was made to form the oxide to a thickness of about 50 Å to about 100 Å, since determining the optimum or workable

Art Unit: 2823

ranges requires routine experimentation by someone of ordinary skill in the art. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. In re Woodruf, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claims 17, 33 and 51 Wang teaches wherein the barrier layer is formed of an insulating material selected from the group consisting of silicon nitride, silicon oxide, silicon dioxide, silicon carbide and high temperature polymers (column 5).

In re claims 18, 19, 34, 35, 52 and 53, Wang in view of Mizuhara does not disclose wherein the barrier layer is formed to be 30 Å to about 150 Å.

However, thickness is a well known process variable and it would have been obvious to one of ordinary skill at the time the invention was made to form the barrier layer to a thickness of about 30 Å to about 150 Å, since determining the optimum or workable ranges requires routine experimentation by someone of ordinary skill in the art. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. In re Woodruf, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claims 20 and 36, Wang teaches wherein the oxide layer and the barrier layer are further formed over the gate stack, the gate stack including several of spacers formed on sidewalls of the gate stack structure (figure 1).

3. Claims 9, 25 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of Mizuhara as applied to claims 1 – 8, 11, 13 – 24, 27, 29 – 43, 46 and 48 – 56 above, and further in view of Lands et al. (U. S. patent 3,571,914).

Wang in view of Mizuhara does not disclose wherein the oxygen is supplied by in situ steam generation.

However, Lands in the U. S. patent 3,571,914; figures 1 – 4 and related text discloses as a well known process (i.e. a convenience process) to form an oxide layer by subjecting the device to steam by bubbling oxygen (column 3).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use steam as the source of oxygen in the invention of Wang in view of Mizuhara since oxidizing with steam is a well-known process (i.e. a convenience process) as taught by Land.

4. Claims 12, 28 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view Mizuhara as applied to claims 1 – 8, 11, 13 – 24, 27, 29 – 43, 46 and 48 – 56 above, and further in view of Kirimura et al. (U. S. patent 6,383,896 B1).

Wang in view of Mizuhara does not show wherein the oxygen is supplied by a microwave source.

However, Kirimura in the U. S. patent 6,383,896 B1; figures 1 – 4 discloses that forming an oxide with plasma CVD or microwave CVD are art recognized equivalents (column 2).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made wherein the atomic oxygen is supplied by a microwave source as taught by Kirimura since Kirimura teaches that plasma and microwave CVD are art recognized equivalents.

5. Claims 10, 26 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of Mizuhara as applied to claims 1 – 8, 11, 13 – 24, 27, 29 – 43, 46 and 48 – 56 above, and further in view of Asahina et al. (U. S. patent 6,326,287 B1).

Wang in view of Mizuhara does not teach wherein the oxygen is supplied by an ozone source.

However, Asahina in the U. S. patent 6,326,287 B1; figures 1 – 8 and related text, discloses that ozone is preferable since it also helps with the desorption of hydrogen and water (column 8).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have ozone as the oxygen source in the invention of Wang in view of Mizuhara since as taught by Asahina the ozone will help also in the desorption of hydrogen and water.



***Response to Arguments***

6. Applicant's arguments filed 20 February 2003 have been fully considered but they are not persuasive for the foregoing reasons.

Applicant contests that Wang in view of Mizuhara does not disclose, teach or suggest oxidizing the source/drain region with atomic oxygen but instead deposits the oxide layer.

Examiner respectfully submits that Wang in view of Mizuhara shows that the oxide layer can be formed by plasma CVD. Oxygen and a silane gas are entered into a chamber and are converted into plasma, which gives out atomic oxygen. It would be reasonable to assume that at some point the atomic oxygen formed by the plasma would react with the surface of the source/drain region and, to some extent, form an oxide layer on the source/drain region.

***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

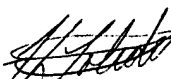
Art Unit: 2823


the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is 703-305-0567. The examiner can normally be reached on Mon-Fri 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7382 for regular communications and 703-308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

  
FToledo  
April 23, 2003

  
George Fourson  
Primary Examiner  
Art Unit 2823